Idaho State Department of Agriculture
Division of Agricultural Resources

Results of Pesticide Testing in the City of Boise—2007 and 2008

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Introduction

In 2007, the Idaho State Department of Agriculture (ISDA) Ground Water Program was awarded a grant by the Environmental Protection Agency (EPA) to test ground water for pesticides in areas of the state having little or no previous pesticide testing. The grant provided resources to conduct initial testing of pesticides at 24 wells in the city of Boise (Figure 1) including 16 privately owned domestic wells, seven city park irrigation wells, and one city golf course irrigation well. The testing was undertaken to develop a better understanding of impacts from urban lawn and tree care pesticides on the shallow aquifer system in Boise. State funds were used to pay for nitrate and common ion testing at the 24 wells sampled in this project.

Pesticides, nitrate, and common ions were evaluated for each well sampled. Laboratory results indicated that all wells sampled had pesticide concentrations that are below any associated health standard. The highest concentration of nitrate-nitrogen (NO_3-N) was 7.9 mg/L, located in the north end of Boise. None of the wells exceeded the EPA Maximum Contaminant Level (MCL) of 10 milligrams per liter (mg/L) for NO_3-N.

Background

ISDA is responsible for a variety of programs, laws, and rules for protection of ground water from pesticides. The division of Agricultural Resources has a cooperative agreement with EPA to implement the Federal Insecticide, Fungicide, and Rodenticide Act. ISDA staff implement Idaho Pesticide Laws and Rules and conducts monitoring duties to fulfill this cooperative agreement. Additionally, the Idaho Pesticide Management Plan (PMP), and the Rules Governing Pesticide Management Plans For Ground Water Protection (PMP Rule) require the state to respond to pesticide detections in Idaho ground water. The state response as outlined in these two documents is based on four distinct levels established by pesticide detection concentrations as they relate to a percentage of a reference point. A reference point is based on a health standard, such as a MCL, lifetime health advisory level (HAL), or reference dose (RfD). ISDA response actions increase and become more stringent as the detection level increases. The PMP Rule divides the pesticide detections into the following levels:

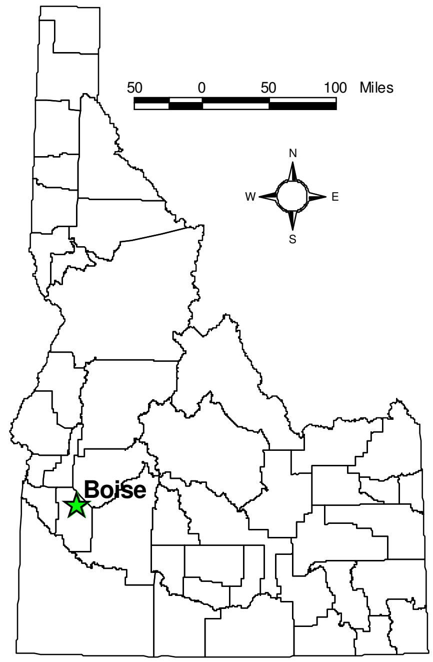

Figure 1. Location of Boise, Idaho.

Level 1: Detection above the laboratory detection limit to less than 20% of the reference point.
Level 2: Detection at 20% to less than 50% of the reference point.
Level 3: Detection at 50% to less than 100% of the reference point.
Level 4: Detection at or greater than 100% of the reference point.

Historical Monitoring (ISDA)

Since the 1990s, the ISDA Ground Water Program has conducted pesticide testing through local and regional-scale ground water monitoring in agricultural areas around the state. ISDA expanded pesticide sampling efforts to urban areas beginning with the Boise urban area in response to urban ground water pesticide detections reported by the United States Geological Survey (USGS) National Water Quality Assessment (NAWQA) project (Gilliom et al., 2006). Fifty-five percent of ground water samples taken from urban areas contained one or more pesticide or degradate detections during the first decade of the USGS NAWQA project (Gilliom et al., 2006). The most frequently detected pesticides in the ground water from the NAWQA study in both agricultural and urban areas were the herbicides atrazine (and the breakdown product desethyl atrazine), metolachlor, prometon, and simazine (Gilliom et al., 2006).

ISDA previously sampled three wells within the Boise Area of Impact (Boise City planning zone outside of city limits) and one well within the Boise city limits (Figure 2). Each well was sampled one time for pesticides. Three of the wells are located in the Southwest Ada County Alliance registered neighborhood association (#28 in Figure 2) and were sampled in either 1995, 1996, or 1997. The following chemicals were detected in all three of the wells:

- Atrazine
- Desethyl Atrazine

The following chemicals were detected in one of the wells sampled by ISDA in the Southwest Ada County Alliance registered neighborhood association (#28 in Figure 2) in 1997:

- Simazine
- 3,5,6-Trichloro 2 Pyridinol

One well sampled by ISDA was located in the West Bench registered neighborhood association (#16 in Figure 1). Atrazine was detected in the well in 1996.

All ISDA ground water pesticide detections in the Boise Area of Impact and the city limits have been at a Level 1 detection, or less than 20% of the reference point.

ISDA has been monitoring approximately 64 wells in the Treasure Valley since 2003 as part of the Lower Boise Regional Project. The wells monitored are located in agricultural areas in the Treasure Valley, however they are part of the same aquifer studied in this project. In 2003, the following pesticides were found in one or more wells in the Lower Boise Regional Project: atrazine, bromacil, dacthal (DCPA), desethyl atrazine, metolachlor, and simazine. In 2007, the following pesticides were detected: atrazine, bentazon, dacthal (DCPA), desethyl atrazine, and tebuthiuron. All ISDA ground water pesticide detections in the Lower Boise Regional Project have been at a Level 1 detection, or less than 20% of the reference point.

Historical Monitoring (IDWR)

A background review of available pesticide ground water data for the Boise urban area was conducted. The Idaho Department of Water Resources (IDWR) samples approximately 25 wells within the Boise Area of Impact or Boise city limits, according to IDWR Internet Map Server Statewide Ground Water Monitoring data (IDWR, 2007). One of the wells located within the area did not have pesticide analysis completed during the monitoring period. Immunoassay analysis was conducted at 11 of the sites, and Gas Chromatography (GC) pesticide analysis was conducted at 13 of the sites. Out of the 24 wells sampled for pesticides, 10 wells had two or more pesticides detected in the ground water.

Three of the wells with pesticide detections are located in the South East Boise neighborhood association (#23 in Figure 2). The wells in South East Boise were tested for pesticides in 1996, 1997, 1999, and/or 2000. Acetochlor was detected in one well in 2000 using the Immunoassay analysis. In 1996, 1997, and 1999, the following pesticides were detected in one or more of the wells using the GC analysis:

- Atrazine
- Desethyl Atrazine
- Simazine

One well located in the Maple Grove-Franklin registered neighborhood association (#24 in Figure 2) was tested for pesticides in 1993, 1997, 1999, and 2002 using the GC analysis. The following pesticides were detected in the well:

- Atrazine
- Dacthal (DCPA)
- Desethyl Atrazine
- Metolachlor
- Simazine

Six wells located in the Southwest Ada County Alliance registered neighborhood association (#28 in Figure 2) were tested for pesticides in 1995, 1996, 1997, 1998, 1999 and/or 2000. Acetochlor was detected in one well in 2000 using the Immunoassay analysis. The following pesticides were detected in one or more of the wells sampled using the GC analysis:

- Atrazine
- Desethyl Atrazine
- Simazine

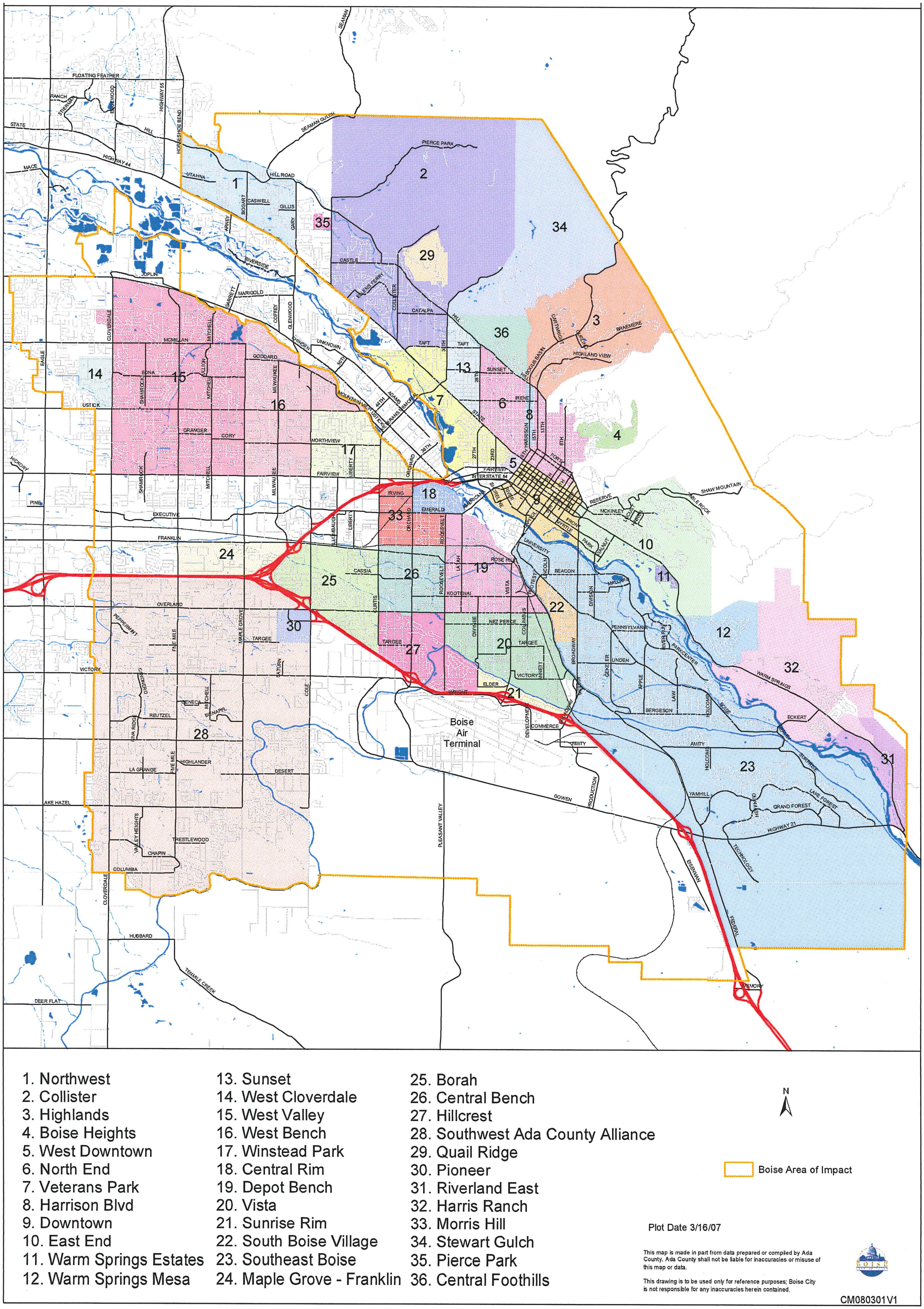

Figure 2. Registered neighborhood associations within the Boise City Area of Impact and Boise city limits. (from City of Boise, 2007).

All IDWR ground water pesticide detections in the Boise urban area have been at a Level 1 detection, or less than 20% of the reference point, according to the IDWR Internet Map Server Statewide Ground Water Monitoring data (IDWR, 2007). Four of the five most commonly detected pesticides in the NAWQA study (Gilliom et al., 2006) were also detected in the Boise urban area from the IDWR monitoring using the GC analysis, including atrazine, desethyl atrazine, simazine, and metolachlor.

Description of Project Area

The project is located within the city limits of Boise, Idaho. The city of Boise has a population of 211,473 (City of Boise, 2008a). In 2006, there were 80,714 households in Boise (Boise Metro Chamber of Commerce, 2008). It is assumed that most of the households have some type of lawn or green space associated with it. There are approximately 1,300 acres of developed park and recreational facilities within Boise that are maintained by the City of Boise Parks and Recreation Department (City of Boise, 2008b). The Parks and Recreation Department also maintains 68 acres of cemeteries and 41,422 trees (City of Boise, 2008b). In addition to residential lawns and city parks there are many businesses located within Boise that have green spaces associated with the facility.

Geology and Hydrogeology

The study area is located on the western portion of the Snake River Plain, which is a northwest trending physiographic lowland as well as a great structural basin separating the Cretaceous Idaho Batholith of west central Idaho from batholith outliers in southwest Idaho (Wood and Anderson, 1981; Othberg, 1994). The study area is comprised of the alluvial valley floor of the Boise River and a series of step-like terraces that run parallel to the Boise River. The terraces were formed by the downcutting of the Boise River and represent former levels of the valley floor. The terraces are located on both the north and south sides of the Boise River, but are better developed and more continuous on the south side (Dion, 1972).

The hydrogeology in the study area has been divided into two aquifers: a shallow system and a deep system that are separated by a thick blue clay layer. This project focused on the water quality of the shallow system.

The shallow system is called the Treasure Valley Shallow aquifer and is composed of unconsolidated gravels and coarse grained sands of the Snake River Group (Neely and Crockett, 1998). The sand and gravel layers that make up the Treasure Valley Shallow aquifer may be discontinuous and local due to the limited lateral extent of the alluvial and fluvial depositional deposits (Neely and Crockett, 1998). However, due to the low percentage of clay within the sand and gravel layers, the discontinuous layers may be connected hydrologically (Neely and Crockett, 1998).

The general direction of ground water flow in the Treasure Valley Shallow aquifer is to the west-northwest. Figure 3 is a potentiometric map constructed from water level measurement data collected in the spring of 2000 by IDWR. In northern Boise, most of the shallow ground water flows to the west-northwest. In some localized areas in southern Boise, the shallow ground water flows to the west-southwest.

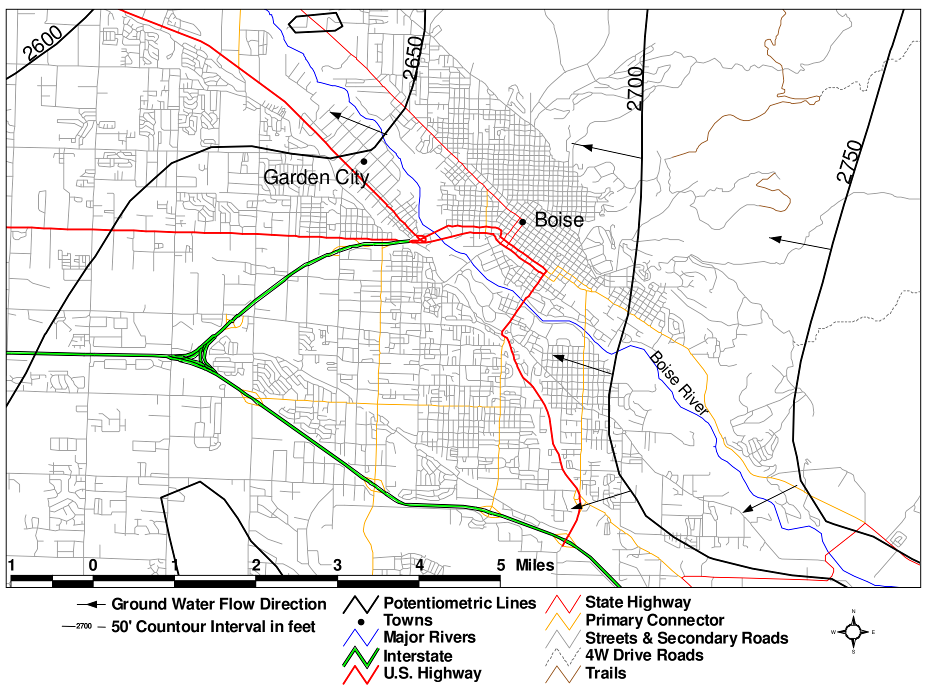

Figure 3. Potentiometric map of the Treasure Valley Shallow aquifer from water level measurements taken in the spring of 2000 by IDWR.

Methods

Well sites for ground water pesticide testing were selected based on a geographic review of existing pesticide data in IDWR and ISDA databases. Existing ground water quality data were overlain on landuse data using GIS software and visually evaluated for green space and pesticide detections. Land use within the project area (i.e., residential, golf course, parks, etc.) was characterized utilizing information from the city of Boise (City of Boise, 2006). Domestic wells in residential areas and green spaces (parks, golf course, etc.) were targeted for this project to study the impact of urban lawn and tree care pesticides on the shallow aquifer system in Boise.

In addition to land use, well depth was used as a criteria. In the flood plain of the Boise River, the well depth accepted for this project was 25 to 100 feet deep. Wells with a depth of less than 75 feet were given preference. In the first terrace (closest to the Boise River), wells with a depth of 100 to 200 feet were selected. Wells with a depth of less than 150 feet were given preference. Well logs were examined and any well screened below the regional clay layer was not used.

The wells selected for this project were within the Boise City limits; no wells in the "Boise Impact Area" were sampled. ISDA attempted to sample wells that were evenly distributed throughout Boise, given the availability of wells that met the sampling criteria and well owner permission. Permission to sample was granted by the land owners prior to sampling. Due to lack of acceptable wells, there are some data gaps in the southwestern portion of the project area. Grant funds provided the resources for covering many of the areas where previous pesticide monitoring has not occured, however, some areas (both urban and agricultural land use) remain untested and will be slated for future monitoring activities.

All sample collections followed established ISDA ground water monitoring standard operating procedures for sampling, handling, storage, and shipping. Samples were sent to the University of Idaho Analytical Sciences Laboratory (UIASL) in Moscow, Idaho for analysis. UIASL used liquid chromatography/mass spectrometry analysis for pesticides utilizing modified EPA Methods 507, 508, 515.2, and 632. ISDA typically uses these methods to analyze for 119 different pesticides in agricultural areas. The list of 119 pesticides were reviewed to determine which chemicals are known to have been used in urban areas in Idaho, either historically or currently. Research included reviewing the USGS NAWQA report (Gilliom et al., 2006) to determine what pesticides were typically found in urban areas, and talking to present and former employees of urban lawn care businesses. Out of the list of 119 chemicals, 54 were chosen for the testing in 2007 (Table 1). For the 2008 testing, UIASL worked to develop methods to add an additional 14 pesticides to the analytical scan that have labeled uses for residential areas (Table 2). These 14 pesticides had not been analyzed for previously by ISDA. For the 2007 and 2008 sampling,

Table 1. Pesticides and EPA Method analyzed for in 2007 for the Boise Urban Project.

EPA Method 507: OP & ON Pesticides

Pesticide	LDL* (µg/L)
Benfluralin	0.05
Bromacil	0.05
Chlorpyrifos	0.025
Cyanazine	0.025
Diazinon	0.025
Dichlorvos	0.05
Diphenamid	0.05
Disulfoton	0.05
EPTC	0.05
Fenarimol	0.05
Hexazinone	0.05
Malathion	0.05
Metalaxyl	0.05
Metolachlor	0.05
Metribuzin	0.025
MGK-264	0.05
Napropamide	0.05
Norflurazon	0.05
Pendimethalin	0.025
Pronamide	0.05
Terbutryn	0.05
Triadimefon	0.05

EPA Method 508: Chlorinated Pesticides

Pesticide	LDL* (µg/L)
Chlordane (alpha)	0.02
Chlordane (gamma)	0.02
Chloroneb	0.025
Chlorothalonil	0.025
DCPA (parent)	0.025
Dichlobenil	0.05
Lindane	0.015
Methoxychlor	0.025
Oxyfluofen	0.05
Permethrin (cis)	0.1

EPA Method 515.2: Chlorinated Acid Herbicides

Herbicide	LDL* (µg/L)
2,4,5-T	0.08
2,4-D	0.2
Bentazon	0.2
Bromoxynil	0.1
Dacthal (DCPA)	0.08
Dicamba	0.08
Dichloroprop	0.25
Diclofop methyl	0.25
MCPA	0.2
MCPP	0.2
Picloram	0.15
Triclopyr	0.1

EPA 632: Phenyl Urea Pesticides

Pesticide	LDL* (µg/L)
Atrazine	0.025
Desisopropyl Atrazine	0.025
Desethyl Atrazine	0.025
Diuron	0.025
Fenamiphos	0.05
Linuron	0.05
Prometon	0.05
Siduron	0.025
Simazine	0.025
Tebuthiuron	0.05

*LDL—Laboratory Detection Limit.

Table 2. Additional pesticides analyzed for in 2008 for the Boise Urban Project.

Pesticide	LDL* (µg/L)
Acephate	0.05
Azoxystrobin	0.05
Chlorsulfuron	0.05
Clopyralid	0.25
Cyfluthrin	0.05
Cypermethrin	0.05
Dichlorvos	0.05
Glyphosate	0.05
Imazapyr	0.05
Imidacloprid	0.05
Iprodione	0.05
Oryzalin	0.05
Propiconazole	0.05
Trifluralin	0.025

*LDL—Laboratory Detection Limit.

UIASL conducted tests for nitrate, nitrite, orthophosphorous, chloride, sulfate, bromide, and fluoride using EPA Method 300.0. Duplicates, blanks, and matrix spikes/matrix spike duplicates were collected and submitted as a part of the quality assurance project plan.

Results

Sampling results indicate some pesticide and NO_3-N impacts have occurred to the shallow aquifer within the Boise city limits. None of the pesticide or NO_3-N concentrations exceeded any EPA or Idaho drinking water standards. Results are summarized and presented in the following sections.

Table 3. Summary of pesticides detected above the minimum laboratory detection limit for the Boise Urban Project.

Pesticide	No. of Detections (24 wells)	Range (µg/L)	Reference point (µg/L)
Atrazine	3 (13%)	0.064 - 0.084	3 (MCL)[1]
Bromacil	1 (4%)	0.39	70 (HAL)[2]
Deisopropyl Atrazine	1 (4%)	0.031	----[3]
Desethyl Atrazine	6 (25%)	0.035 - 0.093	----[3]
Diuron	3 (13%)	0.051 - 0.17	21 (RfD)[4]
Prometon	1 (4%)	0.3	100 (HAL)
Simazine	3 (13%)	0.025 - 0.059	4 (MCL)

[1]MCL – EPA Maximum Contaminant Level
[2]HAL – EPA Lifetime Health Advisory Level
[3]Breakdown product of Atrazine, MCL of 3 mg/L for atrazine is used.
[4]RfD – EPA Reference Dose

Pesticides

Sixteen private domestic wells in the city of Boise were sampled in 2007 for pesticides and eight city park and golf course irrigation wells were sampled in April 2008. Nine wells, or 38% of wells sampled, had one or more pesticide detected above the laboratory minimum detection limit in the ground water (Table 3).

Desethyl atrazine, a breakdown product of atrazine, was detected in six wells, or 25% of the wells sampled (Table 3 and Figure 4). Atrazine, diuron, and simazine were each detected in three wells. Bromacil, desisopropyl atrazine (breakdown product of atrazine or simazine), and prometon were detected in one well each. All detections were below any Idaho or EPA health standard and within the Level 1 category established by the Idaho PMP Rule. All of the detections that were above the minimum laboratory detection limit were privately owned domestic wells. No pesticides were detected above the minimum laboratory detection limit in any of the city irrigation wells.

Pesticide Detections Below Minimum Laboratory Detection Limits

In addition to the pesticides that were detected at a

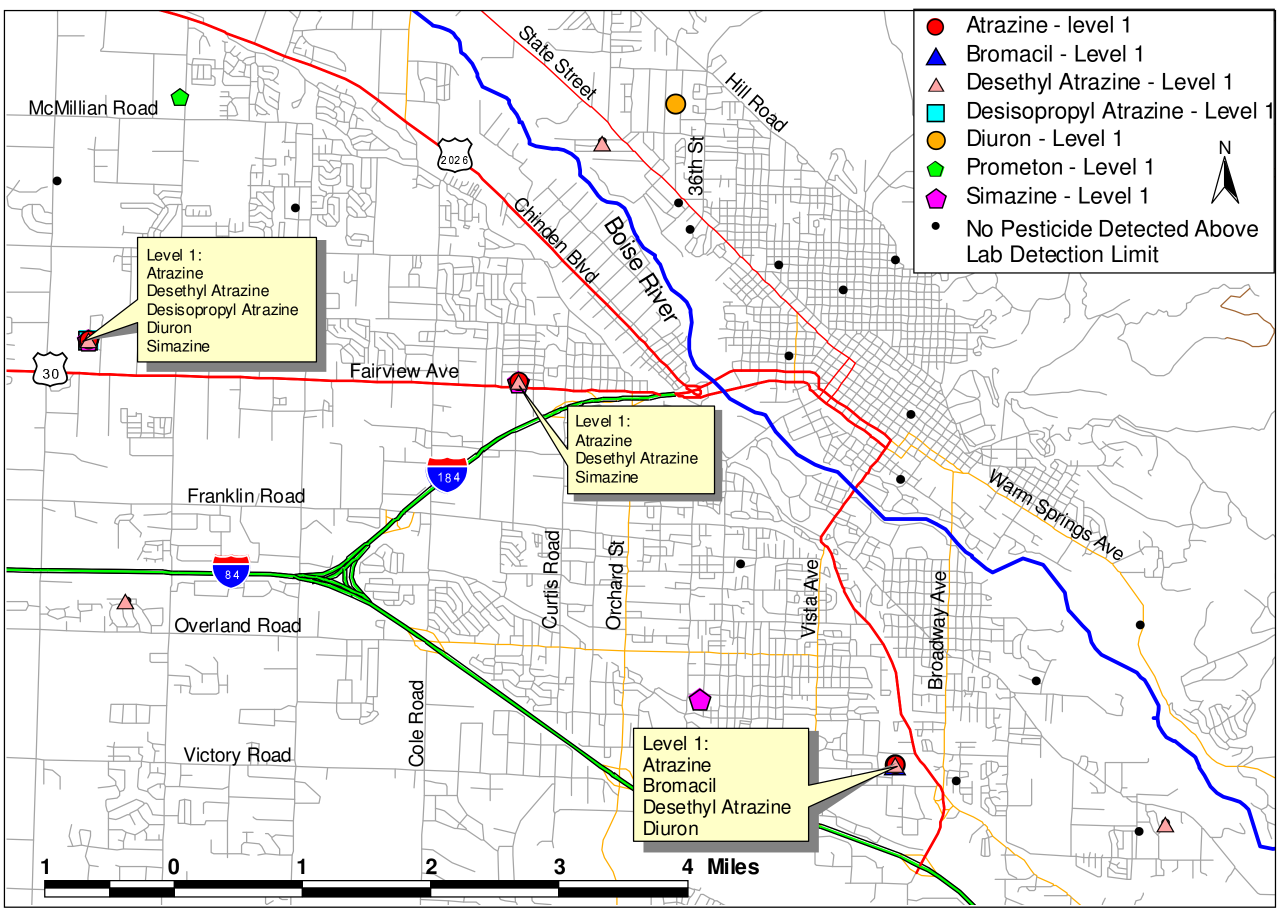

Figure 4. Pesticide results from ISDA 2007 and 2008 sampling of Boise Urban Project.

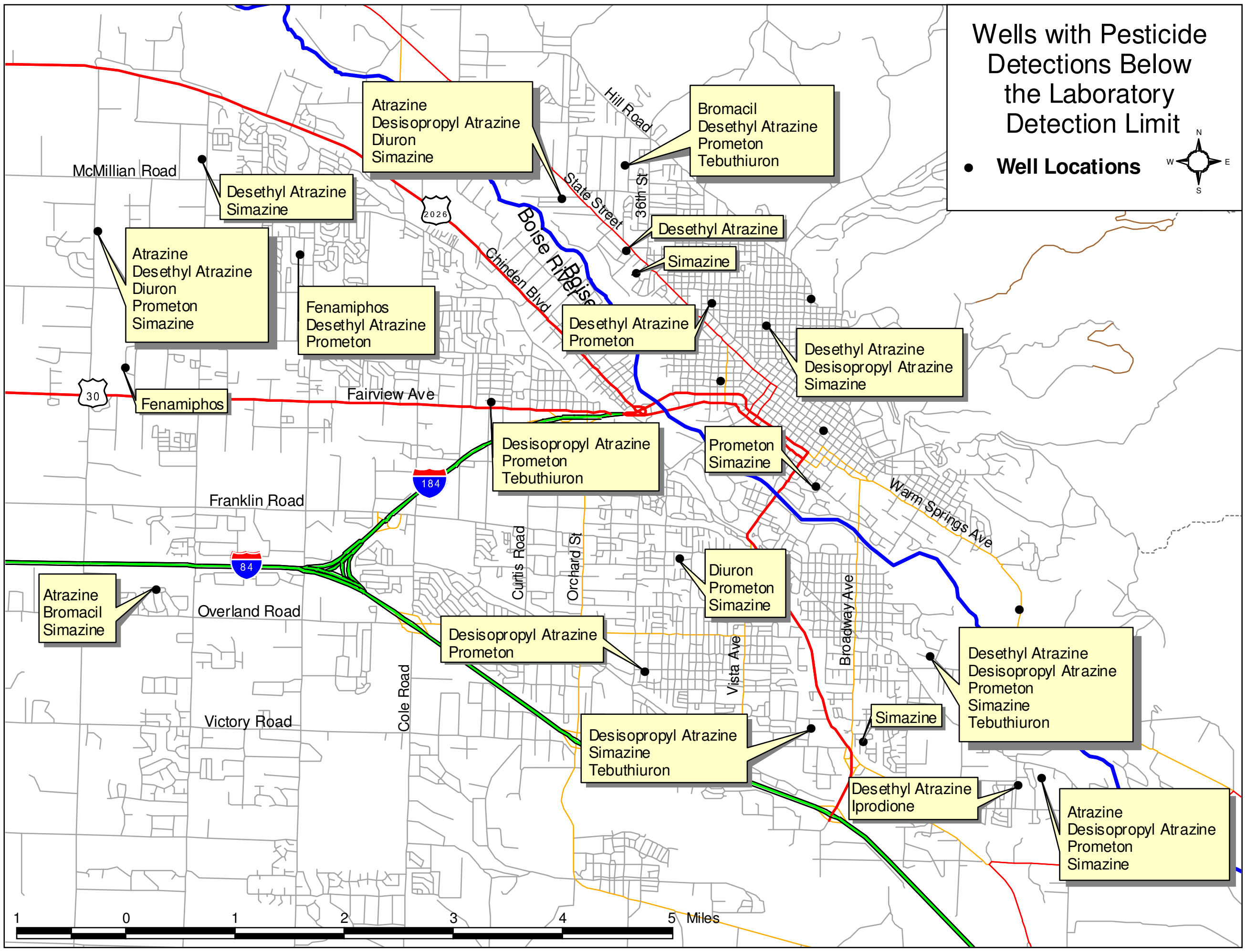

Figure 5. Pesticides detected below the minimum LDL in the Boise Urban Project. Minimum LDL for each pesticide is listed on Table 1 on page 5.

quantifiable concentration, there were numerous detections that were below the minimum laboratory detection limit (Figure 5). Pesticide detections below the minimum laboratory detection limit (LDL) have concentrations too small for the laboratory to quantify. The minimum LDL for each pesticide is listed in Table 1 on page 5. Twenty wells had one or more pesticides detected below the minimum LDL. Simazine was detected below the minimum LDL in 12 wells, or 50% of the wells sampled. Prometon was detected below the minimum LDL in 10 wells, or 42% of the wells sampled. Desethyl atrazine was detected below the minimum LDL in 9 wells (38%) and desisopropyl atrazine was detected below the minimum LDL in 7 wells (29%). Atrazine and tebuthiuron were detected below the minimum LDL in 4 wells each (17%), and diuron was detected below the minimum LDL in 3 wells (13%). Fenamiphos and bromacil were detected below the minimum LDL in 2 wells each (8%). Iprodione was detected below the minimum LDL in 1 well.

The Boise City Parks and Recreation Department uses integrated pest management (IPM) as a strategy of dealing with weeds, insects, and other pests at the city parks. Most pesticide applications are made as spot applications, instead of a broadcast application (Holt, 2008). The two trade names that are most commonly used on the city parks are Confront® and Chaser® (Holt, 2008). The active ingredients in Confront® are clopyralid and triclopyr; the active ingredients in Chaser® are 2,4-D and triclopyr. None of these active ingredients were found in any of the wells sampled for this project.

Pesticide Descriptions

The following information summarizes the chemical characteristics and the labeled use of each pesticide that was detected in this project.

Atrazine is a systemic triazine herbicide used to control broadleaf weeds and some grassy weeds (EPA, 2003a). Urban uses of atrazine includes golf courses and residential lawns (EPA, 2003a). According to EPA (2003a), given the specific nature of atrazine use on lawns, much of atrazine's use on lawns is confined to Florida and the southeast. Less than two percent of the annual 64 to 76 million pounds of atrazine applied each year is believed to be applied in forestry, turf, or other non-agricultural uses (EPA, 2003a). Laboratory studies have shown that atrazine is mobile and persistent and has had widespread detections in ground water and surface water (EPA, 2003a). Common trade names of products that contain atrazine as the active ingredient and are labeled for non-agricultural uses in Idaho are Drexel®, Atrazine 90DF®, and Aatrex Nine-O®.

Diuron is a pre- and post-emergent herbicide used to control a wide variety of annual and perennial broadleaf and grassy weeds (EPA, 2003b). Diuron is mobile and has the potential to leach to the ground water (EPA, 2003b). In 2003, EPA estimated that 30,419 acres of landscapes are treated annually with diuron, with an average application rate of 2 pounds per acre (EPA, 2003b). EPA estimated that the total yearly average amount of diuron used on landscapes was 46,000 pounds and that the maximum yearly total use of diuron was 100,000 pounds (EPA, 2003b). However, the registrant has decided to phase out residential lawn/landscape applications. Other urban applications of diuron occur at railroads (1,577,000 acres with an average of 2,007,000 pounds of diuron applied annually) and roadways (11,400,000 acres with an average of 426,000 pounds of diuron applied annually) (EPA, 2003b). Common trade names of products that contain diuron as an active ingredient and are labeled for non-agricultural uses in Idaho are Krovar® I DF, and Karmex® IWC.

Simazine is a chlorinated triazine selective herbicide used to control most annual grasses and broadleaf weeds (EPA, 2006). Simazine is registered for residential use on turfgrass, including both commercial use on recreational lawns (such as golf courses) and commericial or homeowner use on home lawns (EPA, 2006). The label application rate for turfgrass is 4 pounds of active ingredient per acre. EPA (2006) estimated approximately 1.2 million pounds of simazine is used per year for non-agricultural uses. Laboratory studies have shown that simazine is persistant and highly mobile, and has a strong potential to leach into the ground water, especially in low organic matter soils such as sandy soils (EPA, 2006). Common trade names of products that contain simazine as an active ingredient and are labeled for non-agricultural uses in Idaho are Pramitol®, and Princep®.

Bromacil is a herbicide used for control of annual and perennial weeds (broadleaf and grasses), brush, and woody plants and vines (EPA, 1996). Lab studies have shown that bromacil is very mobile in sand, sandy loam, clay loam, and silt loam soils (EPA, 1996). There is extensive data that shows that bromacil leaches to the ground water as a result of normal agricultural use, however, there is less data available to determine the impact of bromacil applications from use on right-of-ways, which is typical in urban areas (EPA, 1996). Common trade names of products that contain bromacil as an active ingredient and are labeled for non-agricultural uses in Idaho are Hyvar® X, Krovar® I DF, and Barren®.

Prometon is a non-selective bare-ground herbicide labled for pre– and post-emergent applications to manage annual and perennial grasses and broad leaved weeds (EPA, 2007). Many of the registered uses of prometon pertain to both occupational and residential environments, including: walks, driveways, graveled areas, parking lots, around buildings and recreational areas, patios, along fence rows, and curbs (Britton, 2007). Prometon is persistant and mobile in the environment and is detected frequently in the ground and surface water (EPA, 2007). Common trade names of products that contain prometon as an active ingredient and are labeled for non-agricultural uses in Idaho are Pramitol®, and Sonora®.

Tebuthiuron is a herbicide used to control broadleaf and woody weeds, grasses, and brush. Non-agricultural uses include industrial areas, right-of-ways, fencerows, hedgerows, and under pavement, such as roads and sidewalks (EPA, 1994). In 1994, it was estimated that 5,000 to 8,000 acres of roadways were treated with tebuthiuron with an average rate of application was 10 to 15 pounds per acre (EPA, 1994). EPA (1994) determined that tebuthiuron is persistant and mobile and can leach into ground water. Common trade names of products that contain tebuthiuron as an active ingredient and are labeled for non-agricultural uses in Idaho are Spike®, Sprakil®, and Sterilan®.

Fenamiphos is an organophosphate nematicide and insecticide used primarily to control nematodes thrips on various agricultural crops and non-agricultural sites, such as golf courses (EPA, 2002). Due to its chemical characteristics, fenamiphos has the potential to leach into ground water in vulnerable areas (EPA, 2002). This pesticide was historically used in Idaho, however, it is not currently registered in Idaho.

Iprodione is a fungicide used in agricultural and non-agricultural areas. It is registered for use on ornamentals, and turfgrass, including sod farms, golf courses, and institutional and residential lawn areas (EPA, 1998). An estimated 930,000 to 1,730,000 pounds of iprodione are applied annually in the U.S., with much of the usage in agriculture areas (EPA, 1998). Iprodione was historically used in Idaho, however, it is no longer registered for use in Idaho.

Nitrate

Sixteen privately owned domestic wells in the city of Boise were sampled in 2007 and eight city park and golf course irrigation wells were sampled in April 2008 for NO_3-N and other common ions (Table 4). Of the 24 wells tested, the maximum NO_3-N concentration was 7.9 mg/L at a privately owned domestic well located in the north end of Boise (Figure 6). None of the wells exceeded the EPA MCL of 10 mg/L for NO_3-N. Nine wells, or 37.5% of the wells sampled, had nitrate detections between the laboratory detection limit (0.05 mg/L) and less than 2 mg/L. Ten wells, or 42% of the wells sampled, had nitrate concentrations between 2 mg/L and less than 5 mg/L. The median value was 2.5 mg/L, while the mean value was 2.1 mg/L.

Table 4. Summary of nitrate concentrations from the ISDA 2007 and 2008 sampling of the Boise Urban Project.

Concentration Range (mg/L)	Number of Wells
<LDL[1]	2 (8%)
LDL to <2.0	9 (37.5%)
2.0 to <5.0	10 (42%)
5.0 to 10	3 (12.5%)
>10	0
Median Value	2.5
Mean Value	2.1
Maximum Value	7.9

[1]LDL - Laboratory Detection Limit (0.05 mg/L)

Conclusions

Results of testing indicate that pesticides have been found in the Treasure Valley Shallow aquifer within the Boise city limits. Nine wells, or 38% of wells sampled, had one or more pesticide detected in the ground water above the minimum LDL. The percentage of wells with pesticide detections in the Boise city limits is slightly higher than the percentage of wells (22%) that had pesticide detections in the ISDA Lower Boise Regional Project in 2007. The Lower Boise Regional Project sampled the same aquifer as this project, but was located in agricultural areas.

The pesticides detected above the minimum LDL in this project were: desethyl atrazine, atrazine, diuron, simazine, bromacil, desisopropyl atrazine, and prometon. The pesticides were all at concentrations less than 20% of a reference point. This project proved useful in locating areas with pesticides in the ground water.

The median NO_3-N concentration for the project was 2.5 mg/L. The maximum NO_3-N concentration for the project was 7.9 mg/L and was located in the north end of Boise. The majority of the wells had nitrate detections less than 5 mg/L.

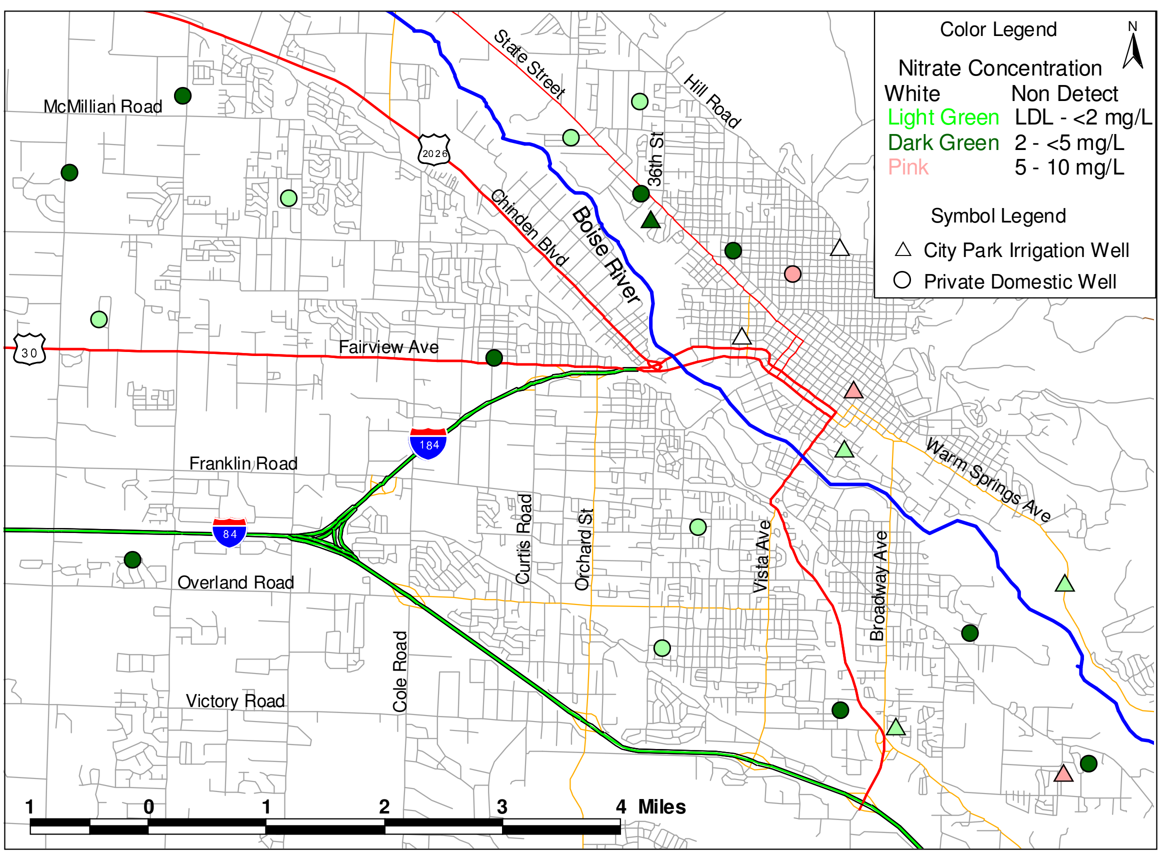

Figure 6. Nitrate results from ISDA 2007 and 2008 sampling of the Boise Urban Project.

Overall, the ground water quality in the areas tested is good. There are minor impacts to the ground water quality from low level pesticide and NO_3-N detections.

Lawn and green space maintenance practices potentially contribute to the pesticide and NO_3-N detections in the ground water of the areas sampled in this project, such as pesticide and fertilizer applications to residential lawns, business properties, and recreation areas such as golf courses, athletic fields, and parks. In addition, roadside and other non-crop area application of pesticides are a potential source of the pesticide detections. Some of the pesticide detections could potentially be the result of historic applications from agricultural practices in areas that have been converted from farm land to residential areas in southeast, southwest, and west Boise.

No pesticides were detected in any city park or golf course irrigation well above the minimum LDL, which suggests the City of Boise Parks and Recreation Department IPM program is a success. The sample set of park irrigation wells was low (8 wells), but this data could be an indicator that turf maintenance at parks is not a ground water concern for pesticides if proper management is used.

Recommendations

ISDA will respond to the pesticide detections from this project in accordance with the response section of IDAPA 02.03.01 Rules Governing Pesticide Management Plans For Ground Water Protection.

ISDA personnel will continue to educate the pesticide applicators on the importance of adhering to label requirements and to apply all pesticides according to federal and state laws.

ISDA Water Program staff recommend similar projects in the future to help identify areas of concern. Areas with little historical testing for pesticides still exist within the state of Idaho.

ISDA recommends a variety of actions to be taken by homeowners, business owners, lawn care businesses, agencies and local governments to prevent further contamination of the aquifer in the project area.

ISDA recommends that the City of Boise Parks and Recreation Department continue with their Integrated Pest Management (IPM) program at the city parks and golf courses. The City of Boise IPM program appears to have been successful as no pesticides were detected above the minimum LDL in the city parks and golf course irrigation wells.

Pesticide and Nutrient Management

ISDA recommends that measures to reduce pesticide and nitrate impacts on ground water be addressed and implemented. ISDA recommends that:

- Pesticide users and sellers evaluate pesticide storage, containment, mixing, loading, rinsing, disposal, and application practices in the project area.
- Homeowners and lawn care professionals conduct nutrient, pesticide, and irrigation water management evaluations. Training to conduct these evaluations are offered annually by the city of Boise, Ada County Extension Office, and United Water. For more information, please visit the website: http://www.unitedwater.com/uwid/consrvid.htm.
- Pesticide users utilize the ISDA Pesticide Disposal Program (PDP). The PDP is a free program in which ISDA will dispose of any unused pesticides that are no longer needed in an environmentally safe manner. Information regarding this program can be found on the ISDA's website: http://www.agri.idaho.gov/Categories/Pesticides/pdp/indexdisposalmain.php.
- Pesticide products that are least likely to leach be chosen for the soil type in the project areas. For a list of pesticide leachability rating, please refer to ISDA's website: http://www.agri.idaho.gov/Categories/Environment/water/waterPDF/factSheets/pesticides/Leachable_brochure.pdf. For assistance in determining your soil type, please contact the Ada County Extension Office at 377-2107.
- Pesticide applicators consider utilizing IPM techniques in this area.
- Pesticide applicators and homeowners assess lawn and garden practices, especially near wellheads.
- Home and garden retail stores establish outreach programs to illustrate proper application and management of nutrients and pesticides.

Well Testing, Construction, and Management

Domestic wells within the project area should be protected to prevent contamination of the shallow aquifer. The ISDA suggests the following options:

- Activities near wellheads be done in a manner that does not impact well water quality.
- Homeowners consider using the Idaho Home*A*Syst program to conduct self assessments related to wellhead protection. The program is found at http://homeasyst.idahoag.us.
- Construction of new wells or deepening of existing wells in the area be completed with the appropriate planning and design considerations following Idaho's laws and rules.

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